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CLAIMS

1. - A procedure for the replacement of a section of a pipe in the primary circuit of a nuclear reactor cooled by pressurised water connecting a first and a second component of the primary circuit of the nuclear reactor, in which positioning of the cuts which have to be made on the pipe, cutting of the section at its two ends, removal of the section, bevelling of the joining ends of parts remaining after the section has been cut out from the primary circuit pipe, adjustment of the new replacement section to length and bevelling of the joining ends of the new replacement section, and positioning and bevel welding of the joining ends of the replacement section onto the ends of the remaining parts of the pipe are performed outside the pipe, wherein in addition to this at least one operation of machining, inspecting and welding an inner part of the joined ends welded together is performed within the pipe through remote control and by remote operation or in a programmed way by introducing and positioning means for carrying out work within the pipe from one of the first and second components of the primary circuit.

2. - A procedure according to claim 1, in the case of the replacement of a section of a primary pipe incorporating at least one branch connection to which is connected at least one line of at least one auxiliary and back-up circuit of the nuclear reactor and in the vicinity of which is located at least one line of an auxiliary and back-up circuit, wherein before the section of the primary pipe requiring replacement is cut out and removed at least one line connected to the section requiring replacement and at least one line located in the vicinity of the primary pipe are cut

out and removed and that after the replacement section has been placed in position and welded at least one line connected to the replacement section and at least one line located in the vicinity of the primary pipe are restored.

3. - A procedure according to claim 1, wherein before cutting and removing the section of the primary pipe which has to be replaced parts of the primary pipe in the vicinity of the ends of the section which has to be replaced and parts of the pipe which will become the ends of the remaining parts after cutting out the section of the pipe which has to be replaced are immobilised through the provision of support.

4. - A procedure according to claim 3, wherein after the ends of the remaining parts of the pipe have been immobilised and before the section which has to be replaced is cut out, cutting planes are marked out on the primary pipe and an accurate topographical survey of the positions of the cutting planes for the section which has to be replaced is performed.

5. - A procedure according to claim 1, wherein after the section which has to be replaced has been cut out, bevelled surfaces are machined on the remaining end parts of the primary pipe and an accurate measurement is made of the distance between the bevelled surfaces of the ends of the remaining parts of the pipe so that a new replacement section can be cut to length and the ends of the new replacement section can be bevelled.

6. - A procedure according to claim 1, in the case of the replacement of a section of a cold leg of the primary

circuit of a pressurised water nuclear reactor joining part of the delivery from a primary pump to the vessel of the nuclear reactor, wherein means for carrying out work are introduced into the cold leg through a volute of the primary pump.

7. - A procedure according to claim 6, the primary pump incorporating above a joint plane in the volute a motorised drive assembly for the rotating part of the pump, wherein the motorised drive part of the pump mounted on the joint plane of the volute is dismantled so that the means for carrying out work can be inserted into the primary pipe through a delivery pipe from the volute of the primary pump.

8. - A procedure according to claim 7, wherein an interface ring is secured onto the joint plane of the volute of the primary pump and a horizontal transfer surface bearing against the interface ring is secured vertically above an opening in the volute of the primary pump designed to support a supporting table which can move in a horizontal direction bearing a lift for the vertical movement of a plate supporting the means for carrying out work in order to introduce the means for carrying out work into the volute of the primary pump and into a delivery pipe constituting an inlet part of the cold leg of the primary circuit of the nuclear reactor.

9. - A procedure according to claim 8, wherein a tube protecting a diffuser of the primary pump is introduced into the volute prior to insertion of the means for carrying out work into the upper vertical axis opening of the volute and a protective basket is fitted into a suction pipe of the volute located in the lower part of the volute, the means

for carrying out work being introduced into the volute through the protective tube within the diffuser.

10. - A procedure according to claim 9, wherein a supporting gangway located along the extension of a lower surface of the delivery pipe is also placed in the volute prior to introducing the means for carrying out work in order to support the means for carrying out work before it is introduced into the cold leg.

11. - A procedure according to claim 10, wherein the means for carrying out work is constructed as a number of assemblable parts comprising a working robot, a support comprising supporting means for means for carrying out work in the primary pipe and a crawler bearing the support and thereby the robot to move the means for carrying out work within the primary pipe and that initially the robot is inserted into the volute as far as the delivery pipe, and then the support and the crawler are assembled together, and in that an operator carries out assembly of the robot and the support within the volute of the primary pump through a rapid connection device and inserts the crawler bearing the frame and the robot into the delivery pipe constituting the inlet part of the cold leg.

12. - A procedure according to claim 1, wherein the operation of machining the inner part of the welds joining the replacement section to the primary pipe is a grinding operation on the inner surface of the weld using a milling head after a partial weld has been made by filling only part of the narrow bevel between the joining ends of the replacement section and the corresponding joining ends of the remaining parts of the primary pipe.

13. - A procedure according to claim 12, wherein an inspection operation using penetrating dye is performed within the primary pipe after grinding the inner part of the partial welds using the means for carrying out work which is remote-controlled in order to position it and remotely operated or programmed for carrying out the successive stages in the penetrating dye inspection.
14. - A procedure for the repair of a defective section of a pipe in the primary circuit of a nuclear reactor cooled by pressurised water connecting a first and a second component of the primary circuit of the nuclear reactor, wherein the operations of inspection, machining and filling by welding are in addition performed within the pipe by remote control and remote operation or programmed operation of the inspection operations through introducing and positioning means for carrying out work within the pipe from one of the first and second components of the primary circuit.
15. - Means for the replacement of a section of a pipe of the primary circuit of a nuclear reactor cooled by pressurised water connecting a first and a second component of the primary circuit of the nuclear reactor comprising means for cutting out a section of the primary pipe which has to be replaced, means for supporting the end parts of a new replacement section in positions facing the ends of the remaining parts of the pipe, means for bevel welding the end parts of a new replacement section of the primary pipe to the ends of the remaining parts of the primary pipe and handling means which can be used to remove the section of the primary pipe which has to be replaced and the new replacement section for positioning it in the welding

position between the ends of the remaining parts of the pipe, wherein it additionally comprises means for working within the primary pipe and means for introducing the means for carrying out work into the primary pipe from one of the first and second components of the primary circuit of the nuclear reactor.

16. - Means according to claim 15, wherein the means for carrying out work comprises a robot arm of the anthropomorphic type, a support for the means for carrying out work within the primary pipe comprising means for securing the robot arm and a carriage for moving the support and the robot arm within the primary pipe to which the support is secured, comprising two sets of wheels and drive motors providing a rotational drive to at least one wheel in each set of wheels of the carriage for moving it within the primary pipe.

17. - Means according to claim 15, wherein the support comprises a structure for supporting the robot arm, two supporting shoes controlled by jacks and one locking shoe controlled by a jack which bear against opposite parts of the inner surface of the pipe.

18. - Means according to claim 15, wherein the means for introducing the means for carrying out work into the pipe through a component of the primary circuit comprise a transfer surface for lateral movement in a horizontal plane on which there is movably mounted in a direction in the horizontal plane a supporting table and a lift for moving a supporting plate for the means for carrying out work borne on the supporting table in a vertical direction, the transfer surface being secured above a horizontal surface of

the component of the primary circuit through which the means for carrying out work is introduced into the primary pipe, surrounding a vertical axis opening providing access to an internal part of the component of the primary circuit communicating with the inner part of the primary pipe.

19. - Means according to claim 15 and also incorporating a support comprising an access gangway to a part communicating with the interior of the primary pipe of the component of the primary circuit.